UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/067,424	02/07/2002	Jeng Ping Lu	7447.0021-01	8498

22852 7590 11/15/2006

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RICHARDS, N DREW	
ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/067,424	LU ET AL.	
	Examiner	Art Unit	
	N. Drew Richards	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-14 and 16-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-14 and 16-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/1/06 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 16 recites the limitation "the plurality of source-drain metal contacts" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 7-14 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) in view of Ishaque et al. (USPAT 5288989, Ishaque) and Possin et al. (USPAT 5777355, Possin).

With regard to claim 7, the AAPA discloses in figure 2 a method for making a high fill factor image array (40). The AAPA discloses in figure 2 providing a plurality of source-drain metal contacts (44) on a substrate (42). The AAPA discloses in figure 2 depositing a passivation layer (56) over the plurality of source-drain metal contacts and the substrate. The AAPA further discloses in figure 2 opening a plurality of via holes through the passivation layer to the plurality of source-drain metal contacts. The AAPA discloses in figure 2 depositing a layer of conductive material (layer above arrow pointing out 46) over the plurality of source-drain metal contacts and the passivation layer. The AAPA discloses in figure 2 depositing a first doped a-Si layer (48) as an optically active layer over the layer of conductive material. The AAPA discloses in figure 2 patterning the first doped a-Si layer and the layer of conductive material to form the collection electrodes (46). The AAPA discloses in figure 2 depositing a continuous layer of i a-Si (50) disposed on the passivation layer and the first doped a-Si layer. The AAPA discloses in figure 2 depositing a continuous second layer of doped a-Si (52) over the continuous layer of i a-Si. The AAPA discloses in figure 2 depositing an upper conductive layer (54) over the second layer of doped a-Si.

The AAPA lacks a teaching of depositing a first passivation layer and reducing the lateral leakage current between the plurality of source-drain metal contacts in the high fill factor image array by depositing a second passivation layer over the first

passivation layer, the second passivation layer being thinner than the first passivation layer.

The AAPA discloses on page 2, lines 19 – 20 that a preferred material for the first passivation layer is silicon oxynitride. The AAPA also discloses on page 3, lines 11 – 18 that an interface with the silicon oxynitride and an overlying layer causes conducting channels to occur between two lateral pixel electrodes thus causing lateral leakage. The AAPA further discloses on page 3, lines 19 – 21 a material different than silicon oxynitride as a passivation layer is advantageous to prevent the conducting channels from forming between two pixel electrodes. Specifically, AAPA teach that one solution to the lateral leakage is to replace the silicon oxynitride passivation layer with silicon oxide at the interface with the a-Si. However, AAPA recognizes that forming the passivation layer of silicon oxide may cause stress build-up that may degrade the sensor structure.

Thus, the AAPA recognizes that silicon oxide is advantageous for the passivation layer at the interface with the a-Si to reduce leakage but that it causes stress build-up.

Ishaque teaches in figure 1 depositing a passivation layer that comprises depositing a first passivation layer (132) over underlying devices and depositing a second passivation layer (134) over the first passivation layer, the second passivation layer (134) being thinner than the first passivation layer (132). Ishaque teaches that one characteristic in a passivation layer is that is should cover the body without cracking or inducing stresses that adversely effect device performance or the dielectric integrity of the passivating layer (column 2 lines 13-17). Ishaque also teach that single inorganic

dielectric layers have been used in some situations but that they cannot be formed to the required thickness to provide the desired passivating characteristics without experiencing debilitating stresses that affect the structural integrity of the dielectric layer and degrade device performance (column 2 lines 49-55). However, Ishaque teaches that the dual passivation layer solves these problems by allowing the inorganic dielectric material layer to be relatively thin so that it is not prone to crack or experience significant stress (column 5 lines 57-60 and column 7 lines 32-36).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the dual passivation layer of Ishaque in the method of the AAPA in order to use a passivation layer that reduces leakage by having the silicon oxide at the interface with the a-Si and provides the desired thickness without causing stress build-up as taught by Ishaque in column 7 lines 32-42. It is noted that depositing the second passivation layer of silicon oxide as taught by AAPA provides the claimed "reducing the lateral leakage current between the plurality of source/drain metal contacts in the high fill factor image array."

It is not clear if the AAPA and Ishaque teach patterning the upper conductive layer to form the image array. Possin teaches in figures 1 and 2; and in the abstract depositing and patterning an upper conductive layer (28). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the patterning step of Possin in the method of the AAPA and Ishaque in order to differentiate the device into a plurality of devices, thus creating an array, which results in cost savings over having to make a plurality of devices separately. It would have been further

obvious in the method of the AAPA in view of Ishaque and Possin that the patterning would form an image array.

Thus, claim 7 is obvious over AAPA in view of Ishaque and Possin.

With regard to claim 11, the AAPA discloses in figure 2 a method for making a high fill factor image array (40). The AAPA discloses in figure 2 providing a plurality of source-drain metal contacts (44) on a substrate (42). The AAPA discloses in figure 2 depositing a passivation layer (56) over the plurality of source-drain metal contacts and the substrate. The AAPA further discloses in figure 2 opening a plurality of via holes through the passivation layer over the plurality of source-drain metal contacts. The AAPA discloses in figure 2 depositing a layer of conductive material (layer above arrow pointing out 46) on the plurality of source-drain metal contacts and the passivation layer. The AAPA discloses in figure 2 depositing a first doped a-Si layer (48) as an optically active layer over the layer of conductive material. The AAPA discloses in figure 2 patterning the first doped a-Si layer and the layer of conductive material to form the collection electrodes (46). The AAPA discloses in figure 2 depositing a continuous layer of i a-Si (50) disposed on the passivation layer and the first doped a-Si layer. The AAPA discloses in figure 2 depositing a continuous second layer of doped a-Si (52) over the continuous layer of i a-Si. The AAPA discloses in figure 2 depositing an upper conductive layer (54) over the continuous second layer of doped a-Si.

The AAPA lacks a teaching of depositing a first passivation layer and reducing the lateral leakage current between the plurality of source-drain metal contacts in the

high fill factor image array by depositing a second passivation layer over the first passivation layer, the second passivation layer being thinner than the first passivation layer.

The AAPA discloses on page 2, lines 19 – 20 that a preferred material for the first passivation layer is silicon oxynitride. The AAPA also discloses on page 3, lines 11 – 18 that an interface with the silicon oxynitride and an overlying layer causes conducting channels to occur between two lateral pixel electrodes thus causing lateral leakage. The AAPA further discloses on page 3, lines 19 – 21 a material different than silicon oxynitride as a passivation layer is advantageous to prevent the conducting channels from forming between two pixel electrodes. Specifically, AAPA teach that one solution to the lateral leakage is to replace the silicon oxynitride passivation layer with silicon oxide at the interface with the a-Si. However, AAPA recognizes that forming the passivation layer of silicon oxide may cause stress build-up that may degrade the sensor structure.

Thus, the AAPA recognizes that silicon oxide is advantageous for the passivation layer at the interface with the a-Si to reduce leakage but that it causes stress build-up.

Ishaque teaches in figure 1 depositing a passivation layer that comprises depositing a first passivation layer (132) over underlying devices and depositing a second passivation layer (134) over the first passivation layer, the second passivation layer (134) being thinner than the first passivation layer (132). Ishaque teaches that one characteristic in a passivation layer is that is should cover the body without cracking or inducing stresses that adversely effect device performance or the dielectric integrity of

the passivating layer (column 2 lines 13-17). Ishaque also teach that single inorganic dielectric layers have been used in some situations but that they cannot be formed to the required thickness to provide the desired passivating characteristics without experiencing debilitating stresses that affect the structural integrity of the dielectric layer and degrade device performance (column 2 lines 49-55). However, Ishaque teaches that the dual passivation layer solves these problems by allowing the inorganic dielectric material layer to be relatively thin so that it is not prone to crack or experience significant stress (column 5 lines 57-60 and column 7 lines 32-36).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the dual passivation layer of Ishaque in the method of the AAPA in order to use a passivation layer that reduces leakage by having the silicon oxide at the interface with the a-Si and provides the desired thickness without causing stress build-up as taught by Ishaque in column 7 lines 32-42. It is noted that depositing the second passivation layer of silicon oxide as taught by AAPA provides the claimed "reducing the lateral leakage current between the plurality of source/drain metal contacts in the high fill factor image array."

It is not clear if the AAPA and Ishaque teach patterning the upper conductive layer to form the image array. Possin teaches in figures 1 and 2; and in the abstract depositing and patterning an upper conductive layer (28). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the patterning step of Possin in the method of the AAPA and Ishaque in order to differentiate the device into a plurality of devices, thus creating an array, which results in cost savings

over having to make a plurality of devices separately. It would have been further obvious in the method of the AAPA in view of Ishaque and Possin that the patterning would form an image array.

Thus, claim 11 is obvious over AAPA in view of Ishaque and Possin.

With regard to claim 16, the AAPA discloses in figure 2 a method for making a high fill factor image array (40). The AAPA discloses in figure 2 providing a source-drain metal contact (44). The AAPA discloses in figure 2 depositing a passivation layer (56) over the source-drain metal contact. The AAPA further discloses in figure 2 opening a via hole through the passivation layer to expose the source-drain metal contact. The AAPA discloses in figure 2 depositing a layer of conductive material (layer above arrow pointing out 46) on the source-drain metal contact such that the layer of conductive material makes electrical contact with the source-drain metal contact. The AAPA discloses in figure 2 depositing a first doped a-Si layer (48) as an optically active layer over the layer of conductive material. The AAPA discloses in figure 2 patterning the first doped a-Si layer and the layer of conductive material to form a collection electrode (46). The AAPA discloses in figure 2 depositing sensor material comprising a continuous layer of i a-Si (50) over the collection electrode and the passivation layer. The AAPA discloses in figure 2 depositing a continuous second layer of doped a-Si (52) over the continuous layer of i a-Si. The AAPA discloses in figure 2 depositing an conductive layer (54) over the continuous second layer of doped a-Si.

The AAPA lacks a teaching of depositing a first passivation layer and reducing the lateral leakage current between the plurality of source-drain metal contacts in the high fill factor image array by depositing a second passivation layer over the first passivation layer, the second passivation layer being thinner than the first passivation layer.

The AAPA discloses on page 2, lines 19 – 20 that a preferred material for the first passivation layer is silicon oxynitride. The AAPA also discloses on page 3, lines 11 – 18 that an interface with the silicon oxynitride and an overlying layer causes conducting channels to occur between two lateral pixel electrodes thus causing lateral leakage. The AAPA further discloses on page 3, lines 19 – 21 a material different than silicon oxynitride as a passivation layer is advantageous to prevent the conducting channels from forming between two pixel electrodes. Specifically, AAPA teach that one solution to the lateral leakage is to replace the silicon oxynitride passivation layer with silicon oxide at the interface with the a-Si. However, AAPA recognizes that forming the passivation layer of silicon oxide may cause stress build-up that may degrade the sensor structure.

Thus, the AAPA recognizes that silicon oxide is advantageous for the passivation layer at the interface with the a-Si to reduce leakage but that it causes stress build-up.

Ishaque teaches in figure 1 depositing a passivation layer that comprises depositing a first passivation layer (132) over underlying devices and depositing a second passivation layer (134) over the first passivation layer, the second passivation layer (134) being thinner than the first passivation layer (132). Ishaque teaches that one

characteristic in a passivation layer is that is should cover the body without cracking or inducing stresses that adversely effect device performance or the dielectric integrity of the passivating layer (column 2 lines 13-17). Ishaque also teach that single inorganic dielectric layers have been used in some situations but that they cannot be formed to the required thickness to provide the desired passivating characteristics without experiencing debilitating stresses that affect the structural integrity of the dielectric layer and degrade device performance (column 2 lines 49-55). However, Ishaque teaches that the dual passivation layer solves these problems by allowing the inorganic dielectric material layer to be relatively thin so that it is not prone to crack or experience significant stress (column 5 lines 57-60 and column 7 lines 32-36).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the dual passivation layer of Ishaque in the method of the AAPA in order to use a passivation layer that reduces leakage by having the silicon oxide at the interface with the a-Si and provides the desired thickness without causing stress build-up as taught by Ishaque in column 7 lines 32-42. It is noted that depositing the second passivation layer of silicon oxide as taught by AAPA provides the claimed "reducing the lateral leakage current between the plurality of source/drain metal contacts in the high fill factor image array."

It is not clear if the AAPA and Ishaque teach patterning the upper conductive layer to form the image array. Possin teaches in figures 1 and 2; and in the abstract depositing and patterning an upper conductive layer (28). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the patterning

step of Possin in the method of the AAPA and Ishaque in order to differentiate the device into a plurality of devices, thus creating an array, which results in cost savings over having to make a plurality of devices separately. It would have been further obvious in the method of the AAPA in view of Ishaque and Possin that the patterning would form an image array.

Thus, claim 16 is obvious over AAPA in view of Ishaque and Possin.

With regard to claims 8, 12, and 17, the Ishaque teaches in figure 1 and column 5, lines 15 – 29 wherein the first passivation layer comprises BCB.

With regard to claims 9, 13, and 18, Ishaque teaches in figure 1 and the abstract wherein the second passivation layer is an oxide. Further, AAPA teaches that the passivation layer in contact with the a-Si is silicon oxide on page 3 lines 19-20.

With regard to claim 10, 14 and 19, Ishaque teaches in figure 1 and column 5, 52 – 53 wherein the second passivation layer has a thickness of about 1000 Å (i.e. the range of between about 400 Å and 1 micron encompasses the claimed range of about 1000 Å).

Response to Arguments

6. Applicant's arguments filed 9/1/06 have been fully considered but they are not persuasive.

Applicant argues that none of the references teach "reducing the lateral leakage current between the plurality of source-drain metal contacts in the high fill factor image

array by depositing a second passivation layer over the first passivation layer." This argument is not persuasive in overcoming the established case of *prima facie* obviousness. Reducing the lateral leakage as claimed is merely a result of the formation of the second passivation layer. The method and resulting structure of the combination of AAPA with Ishaque and Possin would necessarily provide the same reduced lateral leakage as applicant's claimed invention. AAPA teaches that the lateral leakage is due to the interface between the silicon oxynitride (the passivation originally used in the AAPA) and the a-Si. AAPA then teaches that using silicon oxide for the passivation layer will overcome or reduce this leakage. The combination of references relies upon the teaching in the AAPA that silicon oxide is desirable as the interface with the a-Si and upon the teaching of Ishaque that using the two layer passivation will allow the inorganic dielectric such as silicon oxide to be used in a passivation scheme as a thin layer such that stress build-up is avoided. Thus, the applied combination provides the reduced leakage while also providing relief from stress build-up.

Applicant also argues that none of the references teach the second passivation layer being thinner than the first passivation layer. This is not persuasive. Ishaque clearly teaches that the passivation layer made of silicon oxide is thinner than the passivation layer made of BCB. In combining this two layer passivation layer into the method and device of AAPA, it would be obvious to one of ordinary skill in the art to form the BCB as the first passivation layer and the silicon oxide as the second. Thus, it would have been obvious to form the second passivation layer thinner than the first. AAPA teaches a desire or advantage of having the silicon oxide at the interface of the

passivation layer and the a-Si layer and thus it would be obvious to one of ordinary skill in the art to form the silicon oxide layer (which is taught by Ishaque as being the thinner layer) as the second passivation layer claimed. Thus, it is clear that the ordinary artisan would form the first and second passivation layer as claimed.

Applicant also argues that there is no motivation to combine the teachings of Ishaque, Possin and the AAPA. First, it is noted that the applied rejection has been changed to more clearly describe how and why one of ordinary skill in the art would modify the references to arrive at the claimed invention. As such, applicant's arguments against the previously applied motivation are not persuasive. Applicant's arguments as to the motivations provided by Ishaque to include the second passivation layer are moot. The rejection relies upon the teachings of the AAPA to provide motivation for the second passivation layer (silicon oxide) and upon the teachings of Ishaque to provide a method of employing a silicon oxide passivation layer while alleviating the stress build-up problem recognized by both Ishaque and the AAPA.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

N. DREW RICHARDS
PRIMARY EXAMINER